ON THE USE OF THE PHOROMETER IN THE CENTERING AND DECENTERING OF GLASSES.*

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I HAVE for some years been using Steven's phorometer for the proper centering and also for the decentering of glasses. My attention was drawn to this method by patients in whom I had carefully corrected the refractive error in each eye and yet the expected relief had not come. These cases I had previously examined with the phorometer and found the muscular balance of the two eyes to be normal. On making the test again with the glasses on, I found an apparent heterophoria. I had corrected a ciliary muscular strain only to produce by the incorrect centering of the glasses an incoordination of the extraocular muscles of the eyes.

After correcting the refractive error in each eye, I leave the lenses in the trial frame and direct the patient to look at a candle light twenty feet distant through the phorometer. With the latter I produce a vertical diplopia and place the registering point at zero. Providing there has been no tendency to heterophoria before the glasses were adjusted, there should be none now and if there is, it is more than likely due to the fact that the visual axes of the eyes and the optical centers of the lenses do not coincide.

Any attempt at measuring the pupillary distance by the usual methods for the proper adjustment of glasses is most unsatisfactory; one reason being the variation in size of the angle alpha, that is, the discrepancy in the relation of the visual and optical axes are so varied that I found it too inaccurate as a standard of measurement for the proper adjustment of glasses. This is particularly noticeable in high states of ametropia where great care is required.

In hypermetropia the eyes appear to diverge and they do as far as the optical axes are concerned while the visual axes may be without effort perfectly parallel. If left to the optician, who is simply guided by appearances, such glasses will frequently be decentered outwards.

To state a case, a young lady consulted me wearing —8. D. spherical lenses, with vision of 20/20—both. She complained of severe headaches and a drawing feeling in her eyes, especially after attending the theatre or a day spent out of doors. She had consulted several oculists in the past three years but could get no relief. On directing her to look in the distance she appeared to be looking directly through the center of her lenses. On using the phorometer I found an exophoria of 6°. She said that others had observed this and had prescribed stronger glasses as that would correct the divergence so often associated with myopia; another had gone so far as to recommend an operation. With her glasses off the tests were too uncertain, due to the large refractive error and her poor vision. One thing though was noticeable, that her eyes appeared to be convergent. Using the phorometer and separating the lenses in the trial frame until exact vertical images were produced and comparing this distance with the glasses she had been wearing I found them to be decentered 5 m. m. inwards. On calculating I found that an 8D. lens decentered 4.7 m. m. produces the effect of a 4° prism and so I separated her lenses, making the optical centers 64 m. m. apart instead of 59 m. m. This was followed by most gratifying results and an entire amelioration of her disagreeable symptoms. On looking further into this case I roughly calculated that the visual axes was on the reverse side of the optical axes, which would make it more than 6° to the outer side of where it should be and hence the apparent convergence. I have mentioned this case merely as an example of many similar instances.

If in a state of orthophoria, plus glasses are being used to correct an hypermetropia and homonymous images are produced by the phorometer it is evident that the lenses are decentered and we are producing the effect of a prism base inwards or an apparent esophoria. It follows that the lenses are decentered inwards. Without readjusting the phorometer, the lenses are separated by the screw on the trial frame until the two images become exactly vertical, we may then consider that the lenses are exactly centered, for the distance, in the horizontal direction. The distance separating the centers of the two lenses can now be taken.

In regard to vertical centering the same application holds true, only the phorometer is turned to produce an horizontal diplopia. This test is in one respect not so important as the former, as the lenses as a rule are resting horizontally upon the nose. I must mention one exception though and not an unimportant one, where one eye is set vertically higher in the head than the other, though the phorometer shows that their visual axis are parallel in a vertical direction. In such a case if the two lenses are exactly horizontal, one would be too high or the other too low or both according to which eye was set higher. With glasses on an hyperphoria would be induced, which could be corrected by raising one glass above its fellow until the two images in the phorometer became horizontal. I know of only one trial frame on the market that will allow of this vertical motion, which I consider of some importance.

Taking the general consideration that all lenses can be compared to prisms with their bases or apices together to produce a plus or minus lens, exact calculations have been tabulated showing that a lens of known dioptric strength when decentered a stated distance produces the effect of a prism of a certain strength, that is for instance, a 6D. lens decentered 1.6 m. m. produces a deviation of a ray of light comparable to a 1° prism, or if decentered 3.1 m. m. the effect of a 2° prism is produced. As is seen by such calculations the prismatic effect increases in a gradually increasing ratio to the amount of decentering. The difficulty of calculating such things becomes greater when we consider that the prismatic effect of decentering cylindrical lenses decreases gradually as the line of decentering coincides with its axis. Figures and tables concerning these matters are readily obtainable and I believe hardly ever used in any practical application, while in the phorometer we have a simple, ready and accurate means of arriving at practical results without entering into any mathematical calculations.

The phorometer is also useful for the proper decentering of glasses to correct small amounts of heterophoria. The amount of the heterophoria can first be determined by the usual methods and the amount noted. The registering point of the phorometer is placed at zero. The screw on the trial frame can be turned so as to bring the glasses closer together or farther apart, thereby producing a prismatic effect by thus decentering them. If considerable decentering is required the lenses need not be pushed to one side or the other so as to compel the patient to look through the edge of the glass but the optical center of the lens can be decentered in definite relation to the center of its own eliptical shape.

So much depends upon the amount and kind of heterophoria, strength of lens used and the required prism effect, that to lay down any definite plan of procedure is well-nigh impossible. No part of this work, for its successful application, requires so much experience or judgment as the proper use of prisms.

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Most of us can remember the time when the idea that appendicitis was generally caused by foreign bodies was current, an idea which still exists in the minds of most of the laity.—*Journal A. M. A.*